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Gregory, A., Kovshoff, H. & Hastings, R. P. (in press). Academic self-concept and sense of school belonging of adolescent siblings of autistic children. *Research in Developmental Disabilities*.

### Abstract

**Background:** Whilst there is a growing body of research on the psychological outcomes for siblings of autistic children (autism siblings), few studies have considered the school context.

**Aims:** To explore group differences on two school-related self-reported outcomes for autism siblings and siblings of non-autistic children: sense of school belonging, and academic self-concept. Data on self- and parent/carer-reported behavioural and emotional problems were also collected.

**Methods and procedures:** 65 autism siblings and a comparison group of 57 siblings of non-autistic children aged 11 to 16 years completed questionnaires measuring sense of school belonging, academic self concept, and behaviour problems. 73 parents in the autism sibling and 67 parents in the comparison sibling group completed the behaviour problems measure.

**Outcomes and results:** Autism siblings reported significantly lower school belonging and academic self-concept, and had significantly poorer self- and parent- reported behaviour problems. When controlling for demographic variables and internalising and externalizing behaviour, robust sibling group differences on academic variables remained.

**Conclusions and implications:** Autism siblings reported poorer school-related outcomes and increased behavioural difficulties relative to siblings of non-autistic children. There was wide variation in autism siblings' outcomes, highlighting the importance of taking an individualised and contextualised approach to understanding the varying needs of autism siblings.

*Keywords:* autism; siblings; school; self-concept, belonging

### **What this paper adds**

This paper adds to the literature on the outcomes for siblings of autistic children. It is unique in focusing specifically on school-related outcomes for adolescent autism siblings in a moderately large UK sample. This study extends our understanding of the school context for autism siblings beyond variables such as academic attainment, and contributes new knowledge about two broader and more nuanced school-related outcomes linked to self-determination theory; academic self-concept (the need to feel competence) and sense of school belonging (the need to feel relatedness). Moreover, this study includes a range of self-report measures to explore siblings' own perspectives and experiences, as well as incorporating behavioural and emotional adjustment data from siblings and parents/carers to gain multiple informant perspectives and provide a more holistic picture of the sibling experience. Finally, this study considers the impact of possible correlates of poorer school-related outcomes for siblings: demographic variables, and sibling internalising and externalising problems.

### **Highlights**

- The school context has often been omitted from research in sibling groups
- Academic self-concept and school belonging are key factors in understanding school experience
- Siblings of autistic children reported poorer academic self-concept and sense of school belonging
- Group differences remained when controlling for potential confounding variables
- Large variability in outcomes was found, highlighting the importance of differentiation

## 1. Introduction

Approximately 1% of the population are on the autism spectrum (Brugha et al., 2012). Given the heterogeneous nature of autism, autistic individuals present with core strengths and needs, which may impact upon individuals and families in wide-ranging positive and negative ways. Family systems theorists argue that the inclusion of a family member with any additional needs, including autism, has an influence on overall family functioning (Cox & Paley, 1997; Turnbull, Turnbull, Erwin & Soodak, 2006). Consistent with this theoretical framework, researchers have most often focused their attention on exploring the outcomes and experiences of parents/carers (referred to hereafter as parents), and predominately mothers (e.g., Nealy, O'Hare, Powers & Swick, 2012). Historically, this has led to siblings of autistic children (referred to hereafter as autism siblings) being neglected as the foci of research. This is despite the sibling relationship usually being the longest lasting of family relationships, and a source of enjoyment, meaning, and social support (Griffiths & Sin, 2013). Moreover, Rodrigue, Geffken and Morgan (1993) argued for the importance of sibling relationships in promoting all areas of a child's development, particularly social-emotional development. When a sibling has additional needs, sibling relationships may not develop according to 'typical' trajectories. Accordingly, there may be, for example, a change to traditional sibling roles and responsibilities.

Despite the tendency of this area of research to use parents as informants about the sibling, researchers have focused primarily on the identification of indices of poorer psychological adjustment. Accordingly, both individual studies and reviews of the literature have reported mixed social, emotional and behavioural outcomes (e.g. Meadan, Stoner & Angell, 2010; Green, 2013; Aparicio & Minguez, 2015). For example, when compared to a control group of siblings of typically developing individuals, some studies have reported poorer psychological outcomes for autism siblings (e.g. Rodrigue et al., 1993), and others

have reported more positive outcomes (e.g. Stoneman, 2005). Moreover, meta-analytic data from 69 independent studies suggest that relative to non-autistic siblings, siblings of autistic children are more likely to have internalising difficulties, poorer psychological and social functioning, and more maladaptive sibling relationships. Conversely, there were no sibling group differences for general psychological adjustment, externalising behaviours, coping skills, or family functioning (Shivers, Jackson & McGregor, 2018).

These differences across studies are partly due to common methodological limitations in this area of research, such as use of different measures, informants, control groups, age ranges, and sample sizes, but also the reliance on older studies, in which awareness and support for siblings is likely to have improved over time. Nonetheless, some consistent findings have emerged in the literature; siblings of children with disabilities who display behaviour problems (e.g. Neece, Blacher & Baker, 2010; Petalas, Hastings, Nash, Reilly & Dowey, 2012) and siblings who take on increased caregiving responsibilities (e.g. Hannah & Midlarsky, 1985), have been shown to be particularly vulnerable.

To develop a more comprehensive understanding of the benefits and challenges of being an autism sibling, researchers need to consider broader and more systemic outcomes for siblings, in which studies take a more holistic approach to the sibling experience. The Siblings Embedded Systems Framework is a model that promotes this view through identification of interactive factors that aim to account for variation in sibling adjustment (Kovshoff, Cebula, Tsai & Hastings, 2017). This includes the school setting (and the peers/social systems within it) as a context that impacts outcomes. Focusing on more dynamic variables may help promote change and adaptation for siblings, as well as identify areas that could inform the support siblings receive in school.

Currently, there is limited literature primarily focusing on autism siblings' school outcomes and experiences. Studies that do include school-related measures largely do not

solely focus on the broader school context/culture or include school-related aims, but instead focus on identifying psychological adjustment in general. These studies have also produced mixed findings and when compared to siblings of non-autistic children, many researchers have reported no significant differences between groups in the areas of academic achievement (Ben-Yizhak et al, 2011; Chien, Tu & Gau, 2017; Kaminsky & Dewey, 2002; Mates, 1990; Quintero & McIntyre, 2010), school behaviour (Mates, 1990; Quintero & McIntyre, 2010), or school social outcomes (Chien et al, 2017; Quintero & McIntyre, 2010). Of note however, is that other researchers have reported more positive educational outcomes for autism siblings, such as higher academic competence (Rodrigue et al., 1993), academic self-concept (Macks & Reeve, 2007), and social support (Cridland, Jones, Stoyles, Caputi & Magee, 2015; Kaminsky & Dewey, 2002). Conversely, other studies found more negative outcomes for autism siblings, such as poorer academic achievement (August, Stewart & Tsai, 1981; Barak-Levy, Goldstein & Weinstock, 2010), academic self-concept (Chien et al., 2017), and increased school behaviour difficulties (Chien et al., 2017). In addition, one of the few qualitative studies in this area has shown autism siblings to take on increased roles and responsibilities for their autistic sibling when they attend the same school (Cridland et al., 2015), which is also a risk factor for poorer outcomes. These findings reflect the need for more research in this area to promote greater consensus. Nonetheless, these findings suggest that autism siblings are unlikely to automatically experience school adjustment difficulties, but, given particular circumstances, may be at risk for poorer outcomes.

In addition to focusing on questionnaire measures designed to assess increased risk, much of the aforementioned research including studies that have focused on school-related outcomes for autism siblings has neglected the use of psychological theory to inform research questions. One theory that can be applied to education is self-determination theory (SDT) (Deci & Ryan, 1985). SDT states that individuals have three universal and innate

psychological needs necessary for motivation, such as in learning, as well as overall development and wellbeing; relatedness, competence, and autonomy. The ‘relatedness’ element of SDT refers to creating an environment characterised by a sense of security and safety. This can be linked to having a sense of belonging, which includes building secure relationships and connections with other people (Bowlby, 1969), as well as being accepted and feeling cared for (Griffen & Tyrell, 2007; Maslow, 1943, 1970). In education, a sense of school belonging specifically refers to the extent to which students feel accepted, included, respected and supported in and by their school, educators, and student peers, and can provide a measure of the quality of school social relations at a whole school level (Goodenow, 1993a). School sense of belonging (or connectedness) is a particularly important area of focus given research highlighting it to be a protective factor for academic outcomes, as well as promoting positive mental health and wellbeing, and therefore has the potential to promote young peoples’ resilience (e.g. Goodenow, 1993b; Schochet, Dadds, Ham & Montague, 2006). Despite this importance, there are as of yet no published studies exploring this construct in autism siblings.

The ‘competence’ element of SDT refers to feelings of confidence and effectiveness in one’s abilities, and the perception of one’s ability to influence outcomes (Ryan & Deci, 2000). In education, this can be linked to academic self-concept, which involves the identity, belief, and self-perception of one’s academic abilities (Ommundsen, Haugen & Lund, 2005). Although academic self-concept is linked to more positive outcomes (similar to school belonging), such as higher academic attainment (e.g. Marsh & Craven, 2006), there is limited research exploring this construct in autism siblings. Studies that have considered academic self-concept, have only done so as a sub-component of a broader measure of general ‘self-concept’, and found contradictory findings. For example, when compared to a control group, Macks and Reeve (2007) found significantly higher self-reported academic self-concept in



autism siblings, and Chien et al. (2017) found significantly poorer parent-reported attitudes towards schoolwork. To date, no studies have explored academic self-concept in a UK sample, or utilised a more comprehensive questionnaire focusing solely on this construct. The need to feel competence (e.g. academic self-concept) and relatedness (e.g. belonging) is particularly strong in the adolescent period. For example, Brechwald and Prinstein (2011) argued that peer relationships become central to the process of an adolescent's self-concept and identity formation. Petalas et al. (2012) also reported that adolescence is often characterized by decreased levels of sibling interaction and companionship, and instead siblings rely more on their peers for social support. In turn, strong peer friendships are said to be a mediating factor of successful coping in siblings (Macks & Reeve, 2007; Orsmond & Seltzer, 2007). Accordingly, the current study focuses on a sample of high school-aged (11 to 16 years) autism siblings compared to siblings of non-autistic children and young people.

This study addresses aforementioned gaps in the literature in a number of ways: it focuses solely on the school context (rather than psychological adjustment more generally), moves beyond academic attainment to consider broader more nuanced variables that also have the potential to capture more positive outcomes for siblings (rather than the often deficit-focused identification of mental health difficulties), identifies a specific age period (rather than a wide age range), includes autism siblings' own perspectives through self-reported outcomes (rather than parent-reported), uses multiple informants to gain a more holistic picture, and is based on a UK sample.

The aims of the current study therefore were to: (1) to explore group differences in self-reported school belonging and academic self-concept of autism siblings and a comparison group of siblings of non-autistic children; (2) to explore group differences in self- and parent-reported psychological (emotional and behavioural) adjustment and whether any such differences may be associated with group differences in school outcomes.

## 2. Methods

### 2.1. Participants

Participants were required to be aged 11 to 16 years attending high school in the UK. Self-report data were collected from 65 siblings of autistic children (mean age: 12.69, range: 11-15 years) and 57 siblings of non-autistic children (mean age: 12.88, range 11-16 years). In addition to these data, psychological adjustment data were collected from 73 siblings of autistic children and 66 non-autistic siblings' parents (more parents consented to take part than siblings). See Table 1 for a summary of participant characteristics, including sibling age, gender, Multiple Deprivation Index (MDI), whether they spoke English as an additional language (EAL), and any known illnesses, disability or mental health diagnosis (based on the WHO (2018) definition of disability). The family home postal (zip) code was also used to calculate the neighbourhood deprivation score (MDI) in centiles with 1 being the 10% least deprived neighbourhoods, and 10 being the 10% most deprived neighbourhoods in their UK country (Ministry of Housing, Communities and Local Government for England, 2015; Welsh Government, 2014; Scottish Government, 2016; Northern Ireland Statistics Agency, 2017).

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Table 1 about here  
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### 2.2. Questionnaire measures

In addition to a demographic questionnaire, three questionnaires were included to measure the constructs identified; Myself-As-A-Learner Scale (MALS; Burden, 1998), The Belonging Scale (TBS; Frederickson, Simonds, Evans & Soulsby, 2007), and the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997).

**Demographic questionnaire.** A demographic questionnaire was constructed for the purposes of this study and completed by parents. This was used to gather the information in Table 1 about age, gender, MDI, EAL, and any known illnesses, disability or mental health diagnosis.

**Academic self-concept.** To explore academic self-concept, the MALS was self-reported by siblings. This is a 20-item questionnaire for children aged 8 to 16 years. The MALS measures children's emotional perceptions and beliefs of themselves as learners and problem-solvers within educational settings and is standardised on British school children. Example items include 'when I am given new work to do, I usually feel confident to do it' and 'learning is easy.' Participants rate items on a five-point Likert scale from 5 = 'definitely agree' to 1 = 'strongly disagree'. Scores are reversed for negatively phrased items leading to an overall score between 20 and 100. A score between 60 and 82 is considered average, a score below 60 is representative of 'low' academic self-concept, and a score above 82 is representative of 'high' academic self-concept. In the current study, Cronbach's alpha was .933.

**Sense of school belonging.** Siblings' school belonging via the TBS was self-reported. This is a 12-item questionnaire for children aged 8 to 14 years. TBS is adapted to be used on a British population of children, from Goodenow's (1993a) 18-item Psychological Sense of School Membership (PSSM) scale, which was developed for American adolescents. TBS measures psychological membership to school, which is the extent to which individuals feel accepted, included, respected and supported at school. Example items include 'I feel really happy at my school' and 'I feel very different from most other kids here.' Participants have to rate items on a three-point Likert scale from 1 = 'no not true' to 3 = 'yes true.' Scores are reversed for negatively phrased items and are computed and given a mean average score, with

final scores ranging from 1-3. Scores below the mid-point (2) are used to identify pupils who have 'low' school belonging. In the current study, the Cronbach's alpha was .826.

**Psychological adjustment.** To explore siblings' behavioural and emotional adjustment, the SDQ was used. The SDQ is a 25-item measure for use with 4 to 16-year-olds (parent-report) and 11 to 17-year-olds (self-report). Items are separated into five subscales; conduct problems, emotional symptoms, hyperactivity/inattention, peer relationships, and prosocial behaviour. Example items include 'I finish the work I'm doing. My attention is good' and 'other children or young people pick on or bully me.' Participants have to rate items on a three-point Likert scale from 0 = not true to 2 = certainly true. Scores are reversed for negatively phrased items. Conduct problems and hyperactivity/inattention scores are combined to give a score out of 20 for 'externalising difficulties', and emotional symptoms and peer relationships are combined to give a score out of 20 for 'internalising difficulties'. The total difficulties score combines the externalising and internalising difficulties subscales to give a score out of 40. The SDQ has been found to have good psychometric properties (Goodman, 2001). In the current study, the Cronbach's alphas were .76 (self-report) and .78 (parent-report) for the Total Difficulties score, .79 (self-report) and .82 (parent report) for the Internalizing subscale, .77 (self-report) and .71 (parent-report) for the externalizing subscale, and .66 (self-report) and .76 (parent-report) for the prosocial scale.

### *2.3. Procedure*

Ethical approval was obtained from the first author's University Research and Ethics committee. Following this, participant recruitment occurred from October 2017 until April 2018 using an opt-in consent procedure. Study advertisements were shared with specialist schools, mainstream secondary schools, charities, social media, parents who had attended an autism siblings talk for families of autistic children, and through word-of-mouth. Parents interested in taking part responded to the study advertisement via e-mail. Once families were

screened against participant inclusion criteria, parent and sibling information sheets were e-mailed, with links to the online consent forms, questionnaires, and debriefing statements. To thank participants for their time, siblings received a £5 voucher.

#### *2.4. Data preparation*

The data across questionnaires were screened to check for missing items. Nine SDQ items were missing across 5 participants. As the SDQ allows at least three out of five items to be completed per subscale for each participant, and no participant had more than two items per subscale missing, no participants were excluded from the analyses. Instead, the SDQ scoring instructions were followed to score subscales pro-rata for these participants. No other items were missing.

#### *2.5 Data analysis*

To explore group differences on the three outcome measures, independent sample t-tests were employed. Group differences in the proportion of siblings with scores categorised as ‘low’ school belonging and academic self-concept, and ‘atypical’ psychological adjustment, were explored with chi-squared tests of independence/association. To explore whether group differences on school-related outcomes remained after controlling for demographic factors and psychological adjustment (on which the groups also differed and could have driven school outcomes in either group), hierarchical multiple regression analyses were conducted. The first block of predictors included sibling group (autism siblings or siblings of non-autistic children) and demographic factors (age; gender; disability; EAL; level of neighbourhood deprivation); the second block added SDQ internalising and externalising scores. Guidelines by Cohen (1992) were followed for the interpretation of the effect size (small effect  $r = 0.20$ ; medium effect  $r = 0.50$ ; large effect  $r = 0.80$ ).

### 3. Results

#### *3.1. Group differences on self- and parent-report measures*

For the school-related outcomes (See Table 2), autism siblings self-reported significantly lower school belonging and lower academic self-concept than siblings of non-autistic children, (Cohen's  $d = .80$  and  $.66$  respectively). Siblings and parents in the autism siblings group also reported significantly higher total SDQ difficulties (Cohen's  $d = .67$  and  $.80$  respectively). When separated into externalising and internalising difficulties, autism siblings and their parents reported significantly higher SDQ externalising difficulties (Cohen's  $d = .77$  and  $.82$ ). Parents reported autism siblings to have significantly higher SDQ internalising difficulties (Cohen's  $d = .49$ ). However, autism siblings did not self-report more SDQ internalising difficulties (Cohen's  $d = .32$ ). No statistically significant group differences were found with regards to self- and parent-reported prosocial behaviour.

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Table 2 about here  
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Regarding the chi-squared tests, assumptions were checked and where analyses had expected cell counts less than five, results from the Fisher's Exact test are reported instead. Effect sizes are also reported using the Phi statistic ( $\phi$ ). The proportions of autism siblings who self-reported 'low' school belonging and academic self-concept scores were significantly higher than siblings of non-autistic children ( $\phi = .20$  and  $.21$  respectively). Regarding psychological adjustment, the proportions of autism siblings who had self- and parent-reported SDQ total difficulties in the 'atypical' range were significantly higher than non-autism siblings, with small associations ( $\phi = .22$  and  $.28$  respectively) (see Table 3 for a breakdown of scores).

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Table 3 about here

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### *3.2. Examining the robustness of group differences on sibling school-related outcomes*

Sibling group remained a significant predictor of poorer sense of school belonging when all of the potentially confounding demographic variables were controlled, suggesting robust sibling group differences that cannot be accounted for by the demographic variables included in this study (Analysis 1 (model 1)  $R^2 = .172$ ). Conversely, none of the measured demographic variables independently predicted school belonging. When sibling self-reported internalising and externalising SDQ scores were added to the model predicting school belonging, sibling group was still retained as a significant predictor of poorer school belonging (Analysis 1 (model 2)  $R^2 = .524$ ). In analysis 3 (model 2), the inclusion of parent-reported internalising and externalising difficulties to model one also led to a statistically significant increase of 16% and explained 33.2% of the variance of school belonging in total. Again, sibling group remained a significant predictor, along-with parent-reported externalising difficulties, but not internalising difficulties.

With regard to academic self-concept, robust sibling group differences remained when demographic and psychological adjustment variables were added to the model (Analysis 2, models 1  $R^2 = .152$  and 2  $R^2 = .407$ ). In analysis 4 (model 2), the inclusion of parent-reported internalising and externalising difficulties to model one also led to a statistically significant increase of 35.2% and explained 52% of the variance of school belonging in total. The findings from the regression analyses are reported in Table 4.

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Table 4 about here

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#### 4. Discussion

This study aimed to understand school experience for adolescent siblings of autistic children through the investigation of a more nuanced set of school-related outcomes; sense of belonging and academic self-concept. It found robust group differences on these broader school-related outcomes even when demographic and psychological adjustment variables were accounted for. Whilst it is important to note that there was large variation in the school-related and psychological adjustment outcomes for autism siblings, and many autism siblings reported a strong sense of belonging and self-concept, as a group, autism siblings reported experiencing higher rates of externalising and internalising problems, and lower self-concept and sense of belonging.

The rates of lower self-reported school belonging in the autism sibling group found in this study contrasts with previous research exploring other educational outcomes including school social interactions, school adjustment, and support, which have not reported poorer outcomes for autism siblings (e.g. Chien et al., 2017; Kaminsky & Dewey, 2002; Quintero and McIntyre, 2010). This may be because school belonging is a unique construct incorporating perceptions of both peer and teacher support, as well as acceptance, respect, and inclusion via the overall school culture and ethos (Goodenow, 1993a). The contrasting findings may also be explained by the wide age range used in previous sibling research, highlighting perhaps the importance of consideration of school belonging within the period of adolescence (Brechwald & Prinstein, 2011).

It is unclear why the autism siblings reported lower school belonging than their peers. Perhaps they perceived themselves to be ‘different’ to their peers as a function of their sibling status and/or sibling experiences. In turn, they may have felt less like they ‘belonged’ to their ‘typical’ peer group, leading to a lower sense of school belonging. Moreover, due to the



‘invisible’ nature of autism (Milton, 2012; Hoogsteen, Lynee & Woodgate, 2013), peers and school staff may not have recognised that the siblings had a family member with a disability which may have been impacting on the sibling and/or family adjustment (Moyson & Roeyers, 2011).

Another potential explanation for lower school belonging in autism siblings may stem from research which has reported that autism families experience increased levels of stigma compared to families who have members with other forms of disabilities/needs (Gray, 1993; 2002), possible presence of challenging behaviours, and/or others’ lack of understanding of autism (Gray, 1993). For example, some families have reported being subjected to “avoidance, hostile staring and rude comments from others” (Gray, 2002, p. 734). For siblings, this could potentially lead to targeting or bullying in school and/or feeling isolated or misunderstood. Additionally, some siblings have been identified to have cognitive or social needs that may not meet diagnostic criteria, known as the Broader Autism Phenotype (BAP; Piven, 2001), which may impact their social interactions and in turn their school belonging.

In terms of how confident siblings felt as learners in the school environment, this study also found significantly lower academic self-concept amongst autism siblings. This finding mirrors those of Chien et al. (2017), who reported poorer attitudes towards schoolwork amongst autism siblings, although this was via parent- rather than self-report. Conversely, Macks and Reeve (2007) found higher self-reported self-concept scores in the academic sub-domain in their sample. These mixed findings may reflect the different educational systems for studies in different countries, or may be a function of methodological limitations, including Mack’s and Reeve’s (2007) small comparison group sample size, and/or questionnaire and measurement differences.

Significantly higher self- and parent-reported psychological adjustment problems in autism siblings relative to siblings of non-autistic children replicates studies that have highlighted increased risk for psychological difficulties (e.g. Hastings 2003; Rodrigue et al., 1993). Higher rates of externalising and internalising difficulties in the current sample may be due to the adolescent age range being when the first onset of mental health problems are likely to occur (Mind, 2018; Young Minds, 2018). This could partly be explained by physical and emotional changes related to puberty, or mental health needs that are triggered by academic pressures, such as examinations, which typically increase at high school (Mind, 2018). For autism siblings specifically, the potential challenges of being an autism sibling combined with these academic pressures and biological changes may lead to reduced resilience and increased risk of and sensitivity to psychological adjustment difficulties. Moreover, low sense of belonging is said to lead to feelings of anxiety and depression (Frederickson & Dunsmuir, 2009). Perhaps school belonging, academic self-concept and psychological adjustment factors may be impacting each other bi-directionally.

Findings reporting significantly higher self- and parent-reported externalising difficulties in autism siblings, compared to only parents reporting significantly higher internalising difficulties, may be worthy of note. Autism siblings are at increased risk of receiving less time and attention from parents (Petalas, Hastings, Nash, Dowey & Reilly, 2009) due to the additional needs of the autistic child. Perhaps some autism siblings engage in more externalising behaviours to meet a need for attention from parents. However, this is only speculative. Whilst parents reported elevated internalising behaviour in the autism siblings group, no significant differences in self-reported internalising may simply be reflective of the fact that *all* children and young people are at increased risk of internalising difficulties (e.g. depression and anxiety) in the adolescent period. Therefore, the differences between groups may be masked/less pronounced. Moreover, as internalising behaviours are

more subtle and covert than externalising behaviours, perhaps autism siblings find it harder to self-identify, and therefore self-report, these symptoms in themselves. Conversely, as only parents reported significantly more internalising difficulties in autism siblings, and given that internalising difficulties are more common in autistic children (Kim et al., 2000), perhaps parents are more vigilant to these symptoms in all their children.

Findings that sibling group significantly predicted both academic self-concept and school belonging in all of the regression models suggests robust sibling differences that cannot be fully accounted for by the included demographic variables or sibling psychological adjustment measures in this study. This also suggests that there are other factors, including those not measured in the current study (e.g. attending the same school as the autistic sibling) associated with being an autism sibling that may influence outcomes on these school-related factors.

Moreover, although more autism siblings had a parent-reported illness, disability, or mental health diagnosis themselves, and the autism sibling sample included more females (which are interesting findings in themselves) these were not significant independent predictors of school-related outcomes. This indicates that including siblings with additional needs in research samples does not necessarily bias the findings in a negative direction. Nevertheless, variables not emerging as significant independent predictors of outcomes in this study does not mean that they are not important for school outcomes. For example, this present study only included a neighbourhood deprivation score, and there are several dimensions to a family's socio-economic status.

#### *4.1. Strengths and limitations*

In comparison to other studies in the area of autism siblings' school outcomes, there are a number of strengths of the present study including a moderate sample size, focus on a narrower age range to identify outcomes specific to the adolescent high school stage of

development, inclusion of a control group who did not have an autistic sibling, a homogenous sample of autism siblings rather than disabilities more generally, a UK sample, and both self and parent reports of psychological adjustment. Furthermore, utilising self-report on all measures allows autism siblings to record their own perspectives, which promotes a more person-centred approach to this area of research.

Nevertheless, there are a number of limitations of this study that need to be taken into consideration. Regarding recruitment, many autism siblings were recruited from social media or parent support groups which are necessarily a self-selecting sample of participants likely to be more in need of support or receiving higher levels of social support and signposting, than those not active on these groups. Moreover, families experiencing significant difficulties may not have perceived themselves as having the time or capacity to take part. In addition, the differing recruitment methods in both groups may have meant that the samples were not representative, or equivalent groups.

Other more general factors that limit the generalisability of findings include the wide spectrum of autism, variability of co-occurring needs, and variation in school settings and support. Moreover, as previously identified, a range of potential predictors/confounders were not collected in this study, including information regarding the autistic sibling such as whether the siblings attended the same school, severity of need of the autistic child, levels of challenging behaviour in the child with autism, parental stress and wellbeing, sibling BAP traits, and demographic information, such as family size and birth order. It is also likely that the non-autistic sibling has both a positive and negative impact on the autistic sibling, but the views and voice of the autistic sibling were not been included as part of this design.

Regarding the study design, the use of questionnaire measures may have led to social desirability bias. As this seems more likely in the 'prosocial behaviour' area, perhaps this accounts for the non-significant findings in this area. Nonetheless, the inclusion of

psychological adjustment data across multiple informants may have helped to overcome this limitation. However, upon reflection, the SDQ may not have been the most appropriate measure of this construct. Although it can inform whether autism siblings have increased areas of need, and while there is pro-social behaviour subscale, the measure does not effectively capture positive or enhanced aspects of thriving, and so cannot inform whether autism siblings have increased areas of strength in areas such as optimism and adaptability. Inclusion of a resilience measure in future research, such as the Resiliency Scales (Prince-Embury, 2007) would promote a positive psychology approach to this area of research, which could help identify sibling strengths.

It is also important to bear in mind that multiple comparisons were made in the analyses for this study, and this may lead to an increased chance of Type I errors. To provide context for the key findings, however, we have included information about effect sizes for the group differences. Nevertheless, the current findings require replication.

There are a number of other avenues that require addressing in future research before findings into autism siblings' school outcomes and experiences can be generalised. As Leach (2014) suggested, a move is needed in this area from pathology to resilience and a shift in focus from static to more dynamic variables, such as school-related outcomes. Firstly, it would be interesting to explore if these findings are replicated in earlier school years, or whether they are unique to the high school phase. Secondly, future research would benefit from measuring academic attainment. Thirdly, more predictors of school-related outcomes could be explored, such as the variables previously mentioned, as well as whether or not siblings attend the same school. Fourthly, longitudinal research would be helpful to explore the causal mechanisms behind why some autism siblings are at increased risk of poorer, or indeed more positive, outcomes. Lastly, qualitative studies are needed in this area of research to explore siblings' school experiences in greater depth.

### ***5. Conclusions and implications for practice***

In accordance with SDT, the findings of the present study suggest that autism siblings are at increased risk of experiencing a lower sense of perceived relatedness and competence in a school context. In addition, autism siblings self-reported significantly lower psychological adjustment scores, with significantly more autism siblings with total difficulties falling in the ‘atypical’ category. This suggests that autism siblings may be vulnerable to developing clinically significant difficulties. These data also suggest the importance of practitioners being involved in school-based consultation, assessment, intervention, training, and research roles within this area to support autism siblings’ school belonging, academic self-concept, and psychological adjustment, particularly where individual, group, or whole school needs are identified.

Despite these significant findings, it is important to note that autism siblings’ reported experiences showed much larger variation than those of siblings of non-autistic children, and this is likely to be a function of a range of multi-dimensional transactional factors. For example, this variation may be suggestive of the wide spectrum of autism, the range of co-occurring strengths and needs, as well as presence of differing risk and protective factors in families (Tomeny, Barry & Bader, 2012). Importantly, these data highlight that it should not be assumed that an autistic sibling automatically negatively impacts an individual.

Accordingly, a person-centred approach to working with, and researching, autism siblings should be promoted to gain individual perspectives on strengths, needs and explanations for difficulties, so that personalised support (where required) can be put in place. Although not yet reflected in the evidence-base, promoting the many positives, as well as challenges, of being an autism sibling in research and practice may be an important aspect of intervention work.

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Table 1

*Participant Characteristics*

Group	Siblings of autistic children			Siblings of non-autistic children		
	<i>M</i>	<i>SD</i>	<i>R</i>	<i>M</i>	<i>SD</i>	<i>R</i>
Age	12.69	1.26	11-15	12.88	1.39	11-16
Neighbour- hood Deprivation	3.67	2.61	1-10	3.68	2.37	1-10
Gender	Male N = 27 (37%) Female N = 46 (63%)			Male N = 34 (51%) Female N = 33 (49%)		
EAL status	Yes N = 5 (7%) No N = 68 (93%)			Yes N = 5 (7%) No N = 62 (93%)		
Diagnosis	Yes N = 15 (21%), No N = 58 (79%)			Yes N = 2 (3%) No N = 65 (97%)		

### Sibling group comparisons

[illegible]



Internalising	Sibling	65	5.86	3.60	57	4.76	3.19	(122)	.076	.32
difficulties									=	
(SDQ)									1.79	
	Parent	73	5.04	3.96	66	3.39	2.61	(126)	.004	.49
									=	
									2.92	
Prosocial	Sibling	65	7.77	1.75	57	8.14	1.55	(122)	.221	.22
behaviour									=	
(SDQ)									1.23	
	Parent	73	7.89	2.09	66	8.42	1.60	(133)	.092	.28
									=	
									1.70	

*Note.* As the number of cases varies for each measure and respondent, the number of participants (N) included in each analysis is also reported.

Table 3

*Chi-squared analyses*

Measure/ outcome	Group	Siblings of autistic children	Siblings of non-autistic children	Test statistics	
		<i>N</i>	<i>N</i>	<i>p</i>	$\phi$
School belonging (TBS)	Sibling	8/65 (12.3%)	1/57 (1.8%)	$p = .036$	$\phi = .20$
Academic self- concept (MALS)	Sibling	16/65 (24.6%)	5/57 (8.8%)	$p = .021$	$\phi = .21$
Behavioural difficulties (SDQ total difficulties)	Sibling	13/65 (20%)	3/57 (5%)	$p = .013$	$\phi = .22$
	Parent	18/73 (25%)	3/66 (5%)	$p = .001$	$\phi = .28$

Table 4

*Hierarchical multiple regression analyses*

DVs	School belonging			Academic self- concept		
IVs	$\beta$	$p$	Test statistic	$\beta$	$p$	Test statistic
	Analysis 1 (model 1)			Analysis 2 (model 1)		
Sibling group	.348	< .001	$F(6, 113) = 3.91, p = .001$	.266	.004	$F(6, 113) = 3.39, p = .004$
Sibling age	-.077	.385		.077	.387	
Sibling gender	-.066	.457		-.067	.457	
Sibling disability	.085	.350		.170	.066	
Sibling EAL	.031	.725		-.102	.250	
Neighbourhood Deprivation	-.135	.125		-.076	.394	
	Analysis 1 (model 2)			Analysis 2 (model 2)		
Sibling group	.177	.015	$F(2, 111) = 40.99, p = < .001$	.181	.025	$F(2, 111) = 23.81, p = < .001$
Sibling age	-.100	.143		.020	.792	
Sibling gender	.047	.511		-.065	.417	
Sibling disability	-.072	.327		< .001	.999	
Sibling EAL	.107	.117		-.011	.887	
Neighbourhood Deprivation	-.082	.225		-.050	.506	

Sibling	-.208	.007		-.457	< .001	
internalising						
Sibling	-.564	< .001		-.188	.034	
externalising						
	Analysis 3 (model 2)			Analysis 4 (model 2)		
Sibling group	.230.	.008	$F(8, 111) =$	.180	.035	$F(8, 111) =$
Sibling age	-.088	.275	6.90, $p = <$	.039, $p =$	.624	7.64, $p = <$
Sibling gender	-.073	.317	.001	-.145	.078	
Sibling disability	-.043	.636		-.039	.657	
Sibling EAL	.041	.610		-.047	.553	
Neighbourhood Deprivation	-.076	.351		-.053	.509	
Parent	-.163	.088		-.461	< .001	
internalising						
Parent	-.357	< .001		-.112	.212	
externalising						

*Note.* Analysis 1 (model 1)  $R^2 = .172$ ; analysis 2 (model 1)  $R^2 = .152$ ; analysis 1 (model 2)  $R^2 = .524$  ( $R^2$  change = .352); analysis 2 (model 2)  $R^2 = .407$  ( $R^2$  change = .254); analysis 3 (model 2)  $R^2 = 0.332$  ( $R^2$  change = .160); analysis 4 (model 2)  $R^2 = 0.355$  ( $R^2$  change = .203).